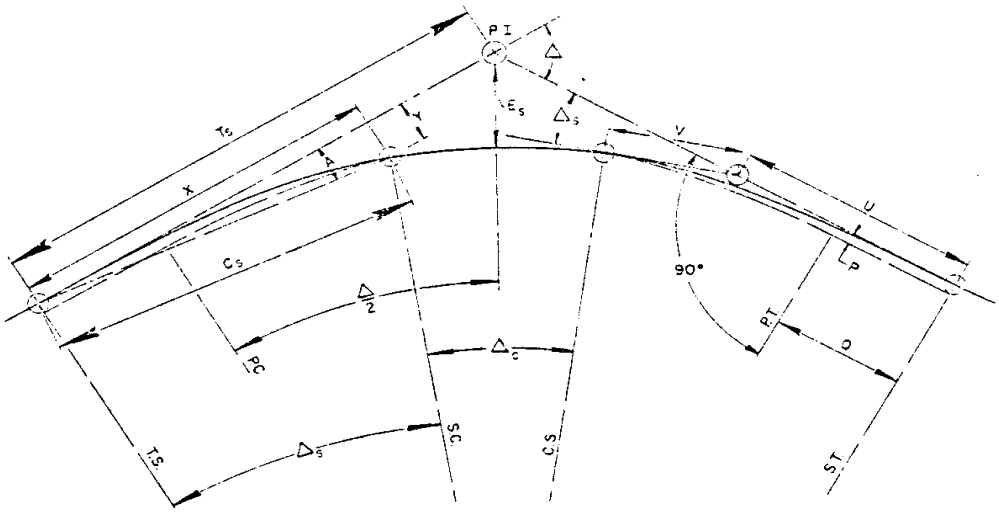
1305 SPIRAL CURVE TRANSITIONS



L_S = LENGTH OF SPIRAL
D = DEGREE OF CURVATURE OF THE CIRCULAR CURVE
T_S = TANGENT DISTANCE
Δ = DEFLECTION ANGLE BETWEEN THE TANGENTS
Δ_S = SPIRAL ANGLE
Δ_C = CENTRAL ANGLE BETWEEN THE S.C. AND C.S.
E_S = EXTERNAL DISTANCE
C_S = LONG CHORD
U = LONG TANGENT
V = SHORT TANGENT

X = SPIRAL CO-ORDINATE (ABSCISSA)
Y = SPIRAL CO-ORDINATE (ORDINATE)
Q = SIMPLE CURVE CO-ORDINATE (ABSCISSA)
P = SIMPLE CURVE CO-ORDINATE (ORDINATE)
A = DEFLECTION ANGLE OF SPIRAL CURVE
K = CONSTANT OF INCREASING CURVATURE
T.S. = TANGENT TO SPIRAL
S.C. = SPIRAL TO CURVE
C.S. = CURVE TO SPIRAL
S.T. = SPIRAL TO TANGENT

SPIRAL CURVE FORMULAS

$\Delta_S = (D\ L_S)/200$ $D = K\ L_S$ $\Delta_S = (K\ (L_S)^2)/200$

TO CALCULATE T_S AND E_S OF A SIMPLE CURVE WITH EQUAL SPIRALS:

$T_S = (R+P)\ TAN\ (\Delta / 2) + Q$ $E_S = (R+P)\ EXSEC\ (\Delta / 2) + P$

$T_S = T + Q + P\ \ TAN\ (\Delta / 2)$ $E_S = E + P/\ COS\ (\Delta / 2)$

TO CALCULATE THE TANGENT DISTANCES OF A SIMPLE CURVE WITH UNEQUAL SPIRALS:

$T_{S1} = ((R+P)_2 / SIN\Delta) - (R+P)_1\ COT\Delta + Q_1$ $T_{S2} = ((R+P)_1 / SIN\Delta) - (R+P)_2\ COT\Delta + Q_2$

FOR DEFLECTION ANGLES TO INTERMEDIATE POINTS ON A SPIRAL:
Δ (IN MINUTES) = $10K\ S^2$, WHERE S = DISTANCE IN STATIONS TO POINT. THIS VALUE MAY HAVE TO BE ADJUSTED DOWNWARD. NOTE THAT THE ONE-TENTH MINUTES OF THE TABULATED DEFLECTION ANGLES FORM A WAVE LIKE PATTERN (EQUIVALENT TO THE ABOVE FORMULA) UNTIL THEY FALL OFF NEAR THE BOTTOM OF THE TABLE. ADJUSTMENTS FOR INTERMEDIATE POINTS MAY BE INTERPOLATED.

TO SET STAKES WITH THE INSTRUMENT SET UP AT A POINT ON THE SPIRAL, WE TAKE ADVANTAGE OF THE FACT THAT THE SPIRAL IS LAID OUT ON A SYSTEM OF CO-ORDINATES. WE FIRST SET THE INSTRUMENT PLATE ZERO PARALLEL TO THE TANGENT TO THE SPIRAL. THIS IS DONE BY SIGHTING BACK ON THE T.S. WITH 'A' FOR THE INSTRUMENT SET-UP POINT ON THE PLATES; OR BY BRINGING THE INSTRUMENT TANGENT TO THE CURVE WITH Δ_S FOR THE INSTRUMENT SETUP POINTS ON THE PLATES. THEN THE DIFFERENCE BETWEEN CO-ORDINATES OF POINTS TO BE SET AND THE INSTRUMENT GIVES US DEFLECTION ANGLES:

$$\text{DEFL. ANGLE} = \text{TAN}^{-1}\ \frac{Y_1 - Y_0}{X_1 - X_0}$$